

CALIFORNIA  
AGRICULTURAL EXTENSION SERVICE

CIRCULAR 81


December, 1933

LADINO CLOVER

B. A. MADSON AND J. EARL COKE

Cooperative Extension work in Agriculture and Home Economics, College of Agriculture,  
University of California, and United States Department of Agriculture cooperating.  
Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914.  
B. H. Crocheron, Director, California Agricultural Extension Service.

THE COLLEGE OF AGRICULTURE  
UNIVERSITY OF CALIFORNIA  
BERKELEY, CALIFORNIA



Digitized by the Internet Archive  
in 2011 with funding from  
University of California, Davis Libraries

# LADINO CLOVER

B. A. MADSON<sup>1</sup> AND J. EARL COKE<sup>2</sup>

Ladino clover (*Trifolium repens* var. *latum*) is regarded as a large form of the common white Dutch clover, and like the latter is a long-lived perennial. Its growth, however, is larger and more luxuriant. It is comparatively shallow-rooted, the root penetration varying from 6 inches to 3 feet, according to the depth and porosity of the soil. The true stems are prostrate, remaining close to the ground, and are rather coarse, with short joints or internodes. If the soil is kept moist, the stems



Fig. 1.—Ladino clover planted in rows March, 1932, and photographed September, 1932. The spreading nature of the plant is shown by the running together of the rows indicated by white stakes.

will elongate and take root at the nodes, so that even a sparse stand will soon thicken and produce an even dense growth (fig. 1). Unlike the white Dutch clover, however, Ladino has little tendency to establish new, independent plants by this vegetative process.

From the numerous joints or nodes, leaf and flower buds arise in great profusion. The leaf stalk elongates rapidly and attains a height of 3 to 20 inches, according to soil and moisture conditions. When the leaf growth has been grazed off, new leaves develop quickly, so that complete recovery occurs in 17 to 28 days. The excellent quality of Ladino pasture is due largely to the fact that the part of the plant available to the grazing animals consists mostly of highly nutritious leaves.

<sup>1</sup> Associate Professor of Agronomy and Agronomist in the Experiment Station.

<sup>2</sup> Specialist in Agricultural Extension.

## HISTORY

The origin of Ladino clover is not definitely known. It comes from Italy, having been known in the upper valley of the Po for over 50 years, and is thought to have developed by a slow process of natural selection from the white Dutch clover.

Seed for trial in this country was first secured by the United States Department of Agriculture in 1903. These early tests were made in the eastern states and proved unsatisfactory, for the crop failed to set seed. Tests were again made in 1911, this time in Idaho, which were successful. Good crops of forage and seed were produced. Commercial seed production was begun in 1918, at which time field plantings were made in southern Idaho.

The earliest recorded planting of Ladino clover in California was made in 1921 by Mr. William Harrison, then farm advisor of Yuba County. Seed for this planting was secured from the United States Department of Agriculture, Washington, D. C. In 1923, John Tomasella of Orland, Glenn County, secured Ladino clover seed from Italy and sowed it in a thin stand of alfalfa. For ten years, this planting has provided excellent pasture in spite of the competition from Bermuda grass. From 1925 to 1929, a few additional trials were made in various parts of the state. The most notable of these was a planting made on very shallow soil belonging to Mr. A. Miedeck of Galt, Sacramento County. Because of the large yields of forage produced as compared with yields secured from other forage crops grown on the same land, the results of this planting were widely published, and served as a stimulus for numerous trials in widely scattered areas of the state.

## IMPORTANCE AND POSSIBILITIES

While Ladino clover is a comparatively new crop in California, the excellent results which have been obtained during the past few years, strongly indicate that in the near future, it may be the most valuable irrigated pasture crop in the state. The results have shown that it can be grown in practically all sections of the state where water is available at sufficiently frequent intervals throughout the growing season. It should not be regarded as a substitute for, but rather a supplement to, alfalfa. On the deeper, more porous soils, or where water is available only at intervals of 3 or 4 weeks as is now the case in most irrigation districts, alfalfa will undoubtedly continue to be the most profitable unless elimi-



nated by disease. There are many soils, however, too heavy or too shallow for alfalfa and many locations where sod-forming weeds or alfalfa diseases rapidly thin out alfalfa stands, where the growing of Ladino will prove highly profitable. The widespread interest in the crop is undoubtedly due to the long felt need for a good irrigated pasture crop, especially for areas not well suited to alfalfa. Ladino clover fills this need better than any crop yet tried.

### ADAPTATION

Ladino clover is a temperate climate plant, and in regions of excessively high temperatures retardation of growth or injury may result.

The crop can be grown on almost any type of soil; but the heavier clay or loam soils, because of their high water-holding capacity, are to be preferred. It does well on shallow soil or on hardpan soil, even when the hardpan is within less than 18 inches of the surface. Being shallow rooted, it does not need a great depth of soil; the hardpan holds the water and prevents it from percolating beyond the reach of the plant roots. Excellent crops have been produced on the red hardpan lands, on the east side of the Sacramento and San Joaquin valleys, which are entirely unsuited to alfalfa. The results with Ladino on very sandy soils have on the whole been unsatisfactory. Under such conditions, the quantity of water necessary is usually excessive and the stand too short-lived to be profitable.

Experience, particularly in Idaho and Oregon and to a less extent in California, has shown that the crop is rather intolerant of alkali.

Ladino clover is strictly an irrigated crop and a good supply of water is essential to its production. As the plant is shallow-rooted, it is impossible even in the most retentive soil to store enough water within reach of the plant roots to supply their needs for more than a few days. To grow Ladino clover successfully, therefore, it is essential that water should be available at sufficiently frequent intervals throughout the growing season to meet the needs of the crop on the particular soil type.

The alfalfa wilt and dwarf diseases do not affect Ladino clover. This crop can, therefore, be successfully grown on land where alfalfa is no longer profitable because of these diseases.

Ladino clover competes satisfactorily with Bermuda grass if given sufficient water. While the sowing of Bermuda grass seed is not recommended, yet where this grass is established and when grown in combination with Ladino, it provides excellent pasture.

### PREPARATION OF LAND FOR LADINO CLOVER

As most of the expense involved in the production of Ladino clover is the cost of irrigation water and its application, too much emphasis cannot be placed on the necessity for careful leveling and preparation of the land for irrigation before the crop is planted. The same system of checks now in use for alfalfa may be used for Ladino, i.e., border, basin, and contour. As the crop is used mainly for pasture, the usual objection that basin or contour checks may interfere with the use of harvesting machinery, does not hold. Very often basin or contour checks can be constructed and leveled with little movement of soil, and are easier as a rule to put in condition to irrigate evenly. In general, the checks should be smaller than for alfalfa in order to facilitate complete coverage with a light application of water. The dense matted growth which Ladino makes, obstructs the surface movement of the irrigation water, so that it is impossible to irrigate large checks without using more water than the crop requires. The sprinkler system of irrigating Ladino clover is proving satisfactory because of the desirability of frequent, shallow irrigation. Installation and operation costs of this method, however, are often prohibitive.

After the checks have been constructed and the land leveled, the seed bed can be prepared by cultivating very lightly with a disk or spring-tooth harrow; or, on loose soil, with a smoothing harrow.

Ladino requires a hard *firm* seed bed. The seed is small and must be planted very shallow. A seed bed that would be considered ideal for alfalfa is too loose for Ladino. If after leveling, the soil is loose and porous, the checks should be irrigated and then cultivated lightly just before seeding. Soils may also be firmed by rolling with a corrugated roller. In some cases where the soil was well settled, but the surface rough, good stands have been obtained by sowing the seed and allowing it to be covered by an irrigation or the winter rains. Some excellent stands have been obtained by simply disking thin stands of alfalfa, grain stubble, and even Bermuda grass sod, and then seeding the clover broadcast and covering with a light drag harrow or corrugated roller. Such procedures, however, are possible only in fields that are already prepared for irrigation.

### LADINO CLOVER SEED

The seed of Ladino clover is very small, being less than one-third as large as alfalfa. A pound of alfalfa contains about 220,000 seeds while a pound of Ladino contains 700,000 seeds. The seed varies in color from

light yellow to brown, the former being the normal color, while the darker color usually indicates weathering. Color, however, is no criterion as to quality. If the seed is plump the weathering is seldom sufficient to reduce germination.

In common with many other legumes, Ladino clover seed contains varying amounts of hard seed ranging from 20 to more than 50 per cent. Hard seeds are those which have a seed coat impervious to water and, therefore, do not germinate readily. A high percentage of hard seeds necessitates a heavier rate of seeding in order to get a good stand. While it is impossible to secure seed that does not contain a considerable quantity of hard seed very high percentages of such seed should be avoided. A good lot of seed should germinate at least 60 per cent.

In purchasing Ladino clover seed, it is important to know the source of the seed. The seeds of Ladino clover, white Dutch clover, and Louisiana white clover are indistinguishable, but the latter two clovers are much inferior to Ladino for forage purposes. Nevertheless during the past few years some white Dutch clover seed has been sold in California as Ladino.

At the present time most of the Ladino clover seed is produced in Idaho and Oregon. Most of this seed is certified as to quality, and buyers, therefore, can be assured of securing good seed by purchasing only certified seed from reputable seed houses. Three grades of certified seed are being produced, the blue, the red, and the yellow-tag seed. Blue-tag seed must meet a very rigid standard of quality, is rather expensive, and is used mainly for the production of certified seed. The red-tag seed carries more white Dutch clover and alsike clover seed, is slightly inferior in quality, and is cheaper; it is perfectly satisfactory, however, for seeding fields that are to be used for forage purposes only. Yellow-tag seed is somewhat inferior to red-tag seed.

### SEEDING

Ladino clover has been successfully seeded every month in the year in California. The best time to sow is either in the fall from the middle of September to the first of November, or in the early spring from the first of February to the middle of March. Other things being equal fall seeding is to be preferred. The long period of moderate or cool temperature, with frequent rains, favors high germination and the likelihood of securing a good stand. Weed growth is apt to be worse on fall-seeded fields; but if kept cut back and not allowed to become too large, weeds are usually not a serious menace to securing a stand.

The chief advantages of spring seeding are that the temperature is likely to be more favorable for germination and the weeds less troublesome. However, as the rainy season is drawing to a close, it will usually be necessary to practice repeated light irrigation, so that the surface of the soil will be kept moist from the time the seed is planted until the plants are well established.

Fall-seeded clover must of necessity be "irrigated up" and several light irrigations from the time it is sown until the winter rains begin may be necessary. During the winter, however, the rains will in the main keep the soil moist enough to prevent the plants from suffering from drought.

Up to the present time most of the Ladino seeded in the state has been seeded alone. It is usually a better practice, however, to seed a mixture of Ladino and one or more grasses. The main reason for the preference for grass mixtures is that animals (except hogs) grazing on the lush succulent clover are very apt to bloat, a trouble which can be greatly reduced if some grasses are included.

When Ladino is seeded alone the usually recommended rate is 4 pounds per acre, although many growers as a matter of safety sow 5 to 6 pounds per acre. If the seed is of good quality, and the seed bed and other conditions favorable, the smaller amount is ample.

When seeding in mixture with grasses approximately the same rate for the clovers should be used as when seeded alone. It should be kept in mind that the prime object is to secure a satisfactory stand of the clover. At best the clover starts slowly and the appearance of the field for the first few months or even the first year may be very disappointing. Ladino clover plants, however, when once established spread quickly, so that a stand of one plant per square foot or even less will ordinarily provide a complete cover.

The grasses sown with Ladino clover should be seeded at a somewhat lighter rate than would normally be used to secure a good stand of the grass. With some of the quicker-growing grasses in particular, if the stand is too thick, the growth of the clover is apt to be retarded.

Examples of some of the mixtures being tried at the present time are :

	<i>Pounds per acre</i>
Ladino clover .....	4
Western grown or domestic rye grass.....	6 to 8
Orchard grass .....	4 to 6
or	
Ladino clover .....	4
Western grown or domestic rye grass.....	6 to 8
Meadow fescue .....	4



The clover and grass mixture should usually be sown broadcast. The Ladino clover seed particularly is very small and must not be covered more than  $\frac{1}{4}$  inch; therefore, there is no advantage in using a drill unless planted during warm weather when slightly deeper planting is necessary. If the seed is to be sown with a broadcast seeder or drill, the clover and the grass should be seeded separately. The mixtures commonly used will not feed evenly through the ordinary seeding equipment.

If the seed is to be broadcast by hand, as is often done, then it is permissible to mix the clover and grass seeds. It is sometimes considered advisable to mix in a quantity of sand or other bulky material in order to facilitate spreading.

If the seed bed is rather rough no covering of the seed will be necessary. The irrigation water or the rains will ordinarily cover the seed deeply enough to ensure germination. With a hard, smooth seed bed, however, covering with a light brush drag or with a roller is advisable.

#### CARE OF NEW STANDS

Ladino clover and most perennial grasses are slow to become established. To get the crop started, keeping the moisture close to the surface is the main requisite. On the part of the grower, patience is the main requirement. Many plantings have been destroyed because the grower became impatient at the slow growth and the poor showing of the crop. While a good stand of both the grass and the clover is desirable, if, as has already been stated, a clover seedling is found to every square foot, a good stand will normally be obtained.

After seeding, repeated light irrigations may be necessary to keep the moisture close to the surface and prevent the surface soil from crusting until the seedlings are well established. If seeded in the fall or early spring, rains will aid materially in keeping the soil moist. The surface of the soil should not be allowed to become dry for more than a few days at a time until the clover seedlings have several permanent leaves. Failure to keep the soil moist while the plants are becoming established probably accounts for more failures than any other single factor.

New stands of Ladino clover should not be pastured until grass in the mixture attains a height of 6 to 8 inches. In the beginning animals should be permitted on the field only while eating and never when the surface of the soil is wet. Shading of the clover seedling by grass or weeds will retard growth, but does not appear to injure permanently either the stand or growth provided the moisture is sufficient. If the grass or weeds become too large, however, they should be removed, either by pasturing or mowing, in order to give the clover a better chance.

## IRRIGATION

As indicated earlier, Ladino clover is strictly an irrigated crop. Frequent irrigation throughout the growing season is necessary for maximum growth and production. The frequency with which it will be necessary to irrigate will, of course, vary with the soil type, and its retention of moisture. Under average conditions, an application of water every 10 to 16 days will be necessary. On a few of the most favorable and retentive soil types, intervals of three weeks or more may be permitted between irrigations, but such conditions will be the exception rather than the rule. During the spring and fall, when the temperature is more moderate, less frequent irrigation is necessary. It should always be borne in mind that the Ladino clover plant is shallow-rooted, and that unless the surface 18 inches to 2 feet of soil containing the majority of roots is kept well supplied with water, the crop will not produce maximum yields.

While Ladino clover requires frequent irrigation, it does not usually require a larger total amount of water than does alfalfa. The individual application should be light and need not exceed more than 1 to 2 acre-inches. All that is necessary is sufficient water to replenish the soil to the depth of the plant roots. Larger applications will not only be wasteful but may be harmful. On the heavy soil, on which much of the clover will be grown, large quantities of water will be apt to collect in pools and in hot weather scald out the stand.

## FERTILIZERS

As Ladino clover has been grown in California for only a few years, no definite information is as yet available on the possible fertilizer needs of the crop. In common with other legumes, its content of mineral elements, particularly calcium, phosphorus, and sulfur, is high. This fact, together with the large growth which the crop makes and the limited feeding area of the roots, must inevitably mean a heavy draft on the mineral constituents of the soil, and the early depletion of these elements. Further, the frequent irrigations to which the crop is subject will tend to leach some of the available minerals beyond the reach of the plant roots, unless irrigated very carefully.

As many of our soils are already low in phosphorus and sulfur, it is highly probable that these elements will be the first to be depleted. Any recession of growth, therefore, will certainly justify a trial with mineral fertilizer to determine if the supply of any of these elements is becoming exhausted.

As the clover will be used chiefly for pasture, a considerable proportion of the mineral elements which the crop contained will, of course, be returned to the soil in the droppings of the animals. In the fall or early winter, after the growth has become partially dormant, the pasture should be harrowed to scatter and break up the droppings of animals and hasten decay. If such returns are supplemented by the use of the accumulation of manure in the barns and corrals, the necessity for commercial fertilizers, especially in the better soils, may be indefinitely delayed.



Fig. 2.—Cattle pasturing on Ladino clover.

### USES

Ladino clover is primarily a pasture crop (fig. 2). Its low, spreading, and dense growing habit, and its quick recovery after being grazed makes it admirably suited for pasture purposes. Some Ladino clover is also cut for hay. The hay produced is of excellent quality, if good curing conditions prevail; but it must be cut more frequently than alfalfa, and is more difficult to mow, due to its dense growth, and is also more difficult to cure properly. It is not recommended as a hay crop where other forms of hay can be grown.

### PASTURE MIXTURES

As indicated earlier, when animals are pastured on Ladino clover exclusively the danger of bloat is always imminent. The usual experience is that for the first two years after Ladino is seeded, there is little trouble from bloat. The prevalence of grasses and weeds, tends to reduce the difficulty. It is only after the Ladino has crowded out such vegeta-



tion, and becomes practically a pure stand, that bloat becomes serious. To reduce the tendency to cause bloat, it is always recommended that some grasses be used with the clover. Unfortunately, the crop is still so new in California that no definite information is available regarding the grasses best adapted to growing with Ladino in the various sections of the state. First of all the grass must be able to hold its own in competition with the clover, it must make a rapid growth producing a good quantity and quality of feed throughout a long growing season, and, in addition, tolerate the heavy pasturing to which the crop will be subjected. To find grasses which will meet these conditions is not easy. A number of species are being tried in different parts of the state and are showing considerable promise. Of these the following are worthy of mention and will be described briefly: rye grass, orchard grass, redtop, Dallis grass, meadow fescue, Harding grass, reed canary grass, and brome grass. As more experience is obtained other species may be found useful while some of the above will doubtless be eliminated.

*Rye Grass (Lolium multiflorum).*—There are many forms of rye grass; the most desirable form is domestic rye, western grown rye, or Oregon rye. Rye grass is one of our quickest-growing grasses, as well as one of the easiest to get established, and should be included in every mixture. Owing to its rapid growth, it provides a large amount of feed the first year while the Ladino is getting started. It also grows well during the winter while the clover is practically dormant.

Rye grasses, however, are short-lived perennials and under conditions most favorable for the clover are usually crowded out and disappear within a few years. The rate of seeding in fall or spring in a mixture is 6 to 8 pounds per acre.

*Orchard Grass (Dactylis glomerata).*—This is a long-lived perennial bunch grass, becomes established easily, and produces a forage of excellent quality. It makes little growth in the winter but starts early in the spring, and continues rapid growth throughout the season. Whether it will be able to hold its own in competition with the clover over a period of years or stand the heavy grazing to which it is likely to be subjected is still unknown. It is one of the most promising grasses. Rate of seeding in mixture, fall and spring, is 4 to 8 pounds per acre.

*Redtop (Agrostis palustris).*—This species has a wider range of adaptation than most other grasses. It will tolerate both wet and rather dry conditions, and also stands a considerable degree of cold. Whether it is sufficiently heat tolerant to withstand conditions in our interior valleys has not yet been demonstrated. While it produces short rootstocks, it is rather bushy in growth, forming tufts 1 to 3 feet in diameter and 1 to 2



feet high. It remains practically dormant during the winter and begins growth in the early spring, similar to most other temperate-climate grasses. The seeding rate in mixture, fall and spring, is 2 to 4 pounds.

*Dallis Grass (Paspalum dilatatum)*.—Dallis grass is a long-lived perennial, which grows in low spreading, leafy clumps, producing rather bare flower stalks which rise to a height of 2 to 4 feet. Though rather tolerant of drought, it makes its best growth under the same conditions required by Ladino clover, i.e., in rather heavy soils and with frequent irrigation. This fact, together with its habit of growth should make it well suited for use in Ladino mixture, and should enable it to hold its own with Ladino as well as any grass now available. Experience in some sections of the state, in fact, indicates this to be the case.

Dallis grass like Ladino clover is rather slow in getting started. Therefore some other quick-growing grass like rye grass or orchard grass should always be included in the mixture. It remains dormant during the winter and unfortunately does not begin growth until the weather warms up in the spring, so that it provides feed only during the warmer part of the year. The seed of Dallis grass is always low in germination, so that a seeding in the spring of at least 4 to 6 pounds per acre is necessary to get a satisfactory stand.

*Meadow Fescue (Festuca elatior)*.—Although distinctly a bunch grass, meadow fescue is similar in growth habit and adaptation to red-top. It grows with somewhat more vigor and under many conditions produces a larger quantity of feed. Although it is being grown experimentally, no definite information is yet available as to its suitability for use with Ladino. The seed is rather large and should be seeded in the fall or spring at the rate of 6 to 8 pounds per acre.

*Harding Grass (Phalaris bulbosa)*.—Harding grass is a perennial which grows in large, dense, leafy tufts, and when once established is extremely persistent. It is one of the few perennials which makes a good growth during the winter, providing a large amount of feed when the clover is practically dormant. During the latter part of the summer, growth is checked, but is luxuriant during the spring and fall if moisture conditions are favorable. It should be able to hold its own in a stand of Ladino successfully. The difficulty of securing satisfactory stands of this grass is one factor retarding its more general use. Harding grass should be seeded in the fall along with the clover at the rate of 2 to 3 pounds per acre.

*Reed Canary Grass (Phalaris arundinacea)*.—Little information is yet available on the behavior of reed canary grass when seeded with Ladino clover. It is a perennial and more prostrate in growth than

Harding grass and becomes established rather slowly. Reed canary grass begins growth in the early spring and continues throughout the growing season. It prefers moist to wet soil; and where water can be applied frequently, as it should be, this grass should do very well. It should be seeded in the fall or spring at the rate of 2 to 4 pounds per acre.

*Brome Grass (Bromus inermis).*—Brome grass is a long-lived perennial which spreads by short underground rootstocks, and has a tendency to produce a sod. Leaves occur abundantly from the base of the plant and from shoots, which develop from the nodes in the stolons. It is highly palatable. Brome grass is a temperate-climate plant. It makes little or no growth during the winter, but will continue to grow throughout the summer, provided a moderate amount of moisture is available. Brome grass can be seeded either in the fall or spring at the rate of 6 to 8 pounds per acre.

*Utilizing Bermuda Grass and Johnson Grass.*—Bermuda grass and Johnson grass may be utilized where infestations of these occur, and where the necessary water is available. In no case is it recommended that either Bermuda grass or Johnson grass be seeded. Good stands of Ladino can be obtained in Bermuda or Johnson-grass-infested areas by disking thoroughly in the fall and seeding with Ladino. Experience has shown that the Ladino will maintain itself with these grasses provided there is no shortage of water.

### ROTATION GRAZING OF PASTURES

Rotation grazing of pastures is absolutely necessary if maximum production is to be secured. Various experiment stations have found that pastures grazed in rotation carry from 10 to 30 per cent more stock than pastures not rotated.

Perennial plants such as Ladino clover, orchard grass, etc., store reserve foods in the roots. This storage does not take place until a plant has made about 80 per cent of its growth. For new growth and root extension the foods stored in the roots are used; therefore, a system of grazing is required which will permit plants to approach maturity.

Rotation grazing is usually attained by dividing the pasture in several divisions or lots, removing the animals from one lot after the forage has been grazed down and permitting the forage on that lot to make considerable growth before again returning the animals to it. The number and size of lots necessary depends on the number of animals to be used, the rapidity of growth of the forage, and the amount of acreage available for pasturing. A desirable-sized lot is one which is grazed short in 5 to 10

days. In many localities this period corresponds to the period between irrigations. For example, if a pasture is irrigated every 12 days, allowing 1 day for the irrigation, 3 days for the land to become sufficiently dry to pasture, 8 days will be left to pasture the crop between irrigations. If 4 lots were provided each would be grazed 8 days and each would have 24 days of growth between grazings.

### CARRYING CAPACITY

The carrying capacity of Ladino clover pastures will, of course, vary with soil, moisture, and climatic conditions. On fair soil with plenty of water, an average Ladino-clover—grass pasture should carry from 1½ to 2 cows per acre for 7 to 9 months. As high as 4 cows per acre for the same period have been reported, but this is far above the average. In general on the shallow soil or on soils of poor water penetration Ladino clover and grass mixtures will produce more forage than will alfalfa. On the lighter or more porous soils or when water is not available at frequent intervals alfalfa will usually outyield Ladino.

### SEED PRODUCTION

Practically all the Ladino clover seed produced in the United States comes from the states of Idaho and Oregon. A few attempts to produce seed in California have been made with little success; however, improper production methods probably account for the lack of success for good quantities of seed are formed under most California conditions.

The blossoms and leaves of Ladino clover are produced on stalks (petioles) arising from surface runners or stems. Soon after the leaf stalks have reached their maximum growth the whitish flower head or flower cluster appears above the leaves. The matured blossoms and leaves if not cut become deflexed forming a mat over the runners and the new growth pushes through this mat. As long as the blossom stalks are not cut, and moisture is applied regularly to the crop, little seed shatters.

The usual seed-producing system permits 4 to 5 crops of blossoms to mature and mat before the crop is cut. The first crop in the early spring is usually grazed or mowed to remove weeds. The crop is then kept growing until early fall. Some growers permit the land to dry slightly as each crop of blossoms mature, hoping to secure larger yields. Others irrigate without regard to the maturity of the blossom. In late summer water is withheld until the mass of leaves and blossoms become dry. The crop is then ready to mow. Stub guards and serrated sickle blades assist in cut-

ting under the tangled mat. As the seed shatters easily at this time many growers harvest only at night.

In some cases each crop of seed, as it matures, is harvested, thus 4 to 5 crops are cut each season. The "straw" from the crop, harvested and threshed in this way, makes excellent feed while the straw from the single-cut crop is of little forage value. It is also claimed that large yields of seed are secured by this system.

Some growers drag a large tin behind the sickle bar on which is piled the Ladino as it is cut. This necessitates a man's following the mower to load the tin. When filled the Ladino is pitched into canvas-lined wagons, then stacked on canvas to completely dry out before threshing.

Special seed-harvesting machines are in use which cut and elevate the Ladino by a series of drapers into canvas-lined wagons. A regular alfalfa thresher with wind and screens adjusted for the small seed will satisfactorily thresh the Ladino seed. Because of the very small sizes of Ladino clover seed, it is difficult for the thresher to separate all of the trash from the seed. The comparative size of Ladino clover seed with other crop seeds is shown in the relative numbers of seeds per pound as follows: Ladino clover 700,000; alfalfa 220,000; orchard grass 400,000; rye grass 300,000; and sweet clover 235,000.

Yields of re-cleaned Ladino clover seed in Oregon and Idaho are said to vary from 100 to 400 pounds per acre. A good yield is said to be about 150 pounds.